

JSC Software Training Plan

AG/Office of the Chief Engineer

May 2005

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National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

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CONCURRENCE AND APPROVAL

May 2005

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CHANGE RECORD

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PREFACE

P.1 Purpose

P.1.1. The JSC Software Training Plan is designed to facilitate the Center meeting the following requirements and guidance of NPR 7150.2, *NASA Software Engineering Requirements*:

- Centers shall maintain and implement a software training plan(s) to advance their in-house software engineering capability and as a reference for their contractors. **[NPR 7150.2 SWE-101]**
- Center software training plans shall meet minimum content requirements. **[NPR 7150.2 SWE-107]**
- Projects shall specify that the software be developed by a Capability Maturity Model (CMM) Level 3/ Capability Maturity Model Integration (CMMI) Level 2 (external lead appraiser) or higher organization. **[NPR 7150.2 SWE-032]**
- Project shall plan, track, and ensure project specific software training for project personnel. **[NPR 7150.2 SWE-017]**
- For Training, Centers should plan to meet or exceed CMMI Level 3.

The JSC Software Training Plan supports the following:

- Identifying the software training needed by the organization.
- Obtaining and providing software training to address those needs.
- Establishing and maintaining software training capability.
- Establishing and maintaining software training records.
- Assessing software training effectiveness.

P.2 Applicability

P.2.1 The JSC Software Training Plan is applicable to all JSC organizations employing civil service employees who perform or manage software development activities (set forth in NPR 7150.2), and to contractors on a voluntary basis. The scope of this plan includes software engineering, software management, software safety and mission assurance, software process improvement and other tasks associated with software development performed by civil servants. The plan identifies the types and levels of software training required by each of the groups identified and the approach for providing the training utilizing existing training resources where available and supplementing when necessary.

P.3 Authority

P.3.1. NPR 7150.2, *NASA Software Engineering Requirements*

P.3.2 [JSC-SLP-4.18, Resource Management](#)

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P.4 References

P.4.1. [*Capability Maturity Model® Integration \(CMMI\)*](#), Organizational Training (OT) Process Area (PA)

P.4.2 [*Capability Maturity Model for Software, Version 1.1*](#)

P.5 Records And Forms

P.5.1 Center Software Training Needs Assessment

P.5.2 SEPG List Of Courses Adequate To Meet The Requirements Of Appendix A (located in the JSC Process Asset Library)

P.6 Cancellation

P.6.1 This document is cancelled when rescinded.

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1.0 RESPONSIBILITIES

1.1 Employees

- 1.1.1 Identify their software training needs to their Supervisor on an annual basis, or as required.
- 1.1.2 Attend approved software training.
- 1.1.3 Complete training evaluations.
- 1.1.4 Complete and maintain their training plan.

1.2 Project Manager

- 1.2.1 Identify, document, and request needed project specific software training.

1.3 Supervisor

- 1.3.1 Identify software training requirements and needs for their employees.
- 1.3.2 Review software training activities on a periodic basis for adequacy, appropriateness, and timeliness.
- 1.3.3 Review successfully completed software training during performance reviews.
- 1.3.4 Locate sources of software training, as necessary.
- 1.3.5 Waive training for those employees who are qualified to have certain software training waived.
- 1.3.6 Review and approve employee training plan.
- 1.3.7 Coordinate the arrangement of software training with the JSC Human Resources.
- 1.3.8 Perform organizational software training needs assessment.

1.4 JSC SEPG

- 1.4.1 Prepare and maintain JPR 2820.1.
- 1.4.2 Perform JSC software training needs assessment.
- 1.4.3 Update and maintain list of courses adequate to meet the requirements of Appendix A.
- 1.4.4 Coordinate software training needs and availability with the JSC Human Resources.

1.5 JSC Human Resources

- 1.5.1 Collect, compile, and review employee feedback from software training courses.
- 1.5.2 Provide facilities, scheduling, announcements, and record keeping of selected software training courses.
- 1.5.3 Arrange, organize, and coordinate software training.

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2.0 IMPLEMENTATION

2.1 Implementation Processes

- 2.1.1 Developing processes for implementing this Plan is the responsibility of each organization. It is expected that a division's existing training processes will be sufficient to implement this Plan.

2.2 Employee Training Plan

- 2.2.1 Supervisors develop a training plan for each employee as part of the annual performance planning process, and upon the employee joining the organization. Training plans are detailed in SLP 4.18, *Resource Management*.
- 2.2.2 The training plan shall ensure employees meet the training requirements of Appendix A.
- 2.2.3 The plan shall identify any additional software training determined necessary by the supervisor.
- 2.2.4 Employee training plans are updated between annual appraisals when changes make the plan obsolete. Examples of such changes include changes to an employee's job assignments.

2.3 Project Training

- 2.3.1 For each project, the project manager identifies project-specific software training needed (if any) by software team members, documents the results in the project Software Development Plan (or equivalent document), and provides the results to the team member's supervisor. The supervisor ensures that each employee's training plan is updated accordingly.

2.4 Branch-Level Planning and Scheduling

- 2.4.1 The supervisor associated with or responsible for software development for each branch-level organization shall, on an annual basis, perform a software training needs assessment. As a minimum, this assessment shall identify the training required to meet the requirements of Appendix A and section 3.6.

2.5 Center-Level Planning and Scheduling

- 2.5.1 The SEPG shall, at least annually, perform a Center software training needs assessment. For this needs assessment, the SEPG shall review the software training needs and issues from each directorate. The SEPG shall identify training needs and issues that would benefit from SEPG action, and facilitate solutions. The SEPG shall coordinate training efforts with the JSC Human Resources.
- 2.5.2 The JSC SEPG shall review, approve, update, and maintain the JSC Software Training Plan.
 - 2.5.2.1 The SEPG shall review the JSC Software Training Plan against the Center software training needs assessment at least annually. The JSC Software

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Training Plan shall be updated as necessary based on updated training requirements or strategy.

2.5.2.2 The SEPG shall maintain the current, approved version of the JSC Software Training Plan.

2.5.3 The SEPG shall create/update a list of courses adequate to meet the requirements of Appendix A to the JSC Software Training Plan. The list of courses is stored in the SEPG PAL, and is updated as necessary.

2.6 Implementation Timeframe

2.6.1 All organizations within the scope of this document shall be in compliance with the minimum requirements of this document within the least restrictive of the following timeframes:

- Employees within plan scope during FY 2005 must be in compliance within eighteen months of the plan approval date.
- Employees accepting a position within Plan scope must meet Plan requirements within one year.
- Exceptions to required software training must be waived in accordance with section 2.7.

2.7 Software Training Waiver Process

2.7.1 An approved waiver is required to vary from the minimum software training requirements of Appendix A. An employee may have software training waived for any required course by their supervisor based on the following criteria:

- Qualified work experience.
- On-the-Job training experience.
- Educational experience.

2.7.2 Record the waived training to the Plan and put the rationale in the employee's training record.

3.0 SOFTWARE TRAINING RESOURCES

3.1 NASA Training Resource Links

- 3.1.1 [NASA Training](#)
- 3.1.2 [NASA People](#)
- 3.1.3 [Gov Online Learning Center \(GoLearn\)](#)
- 3.1.4 [NASA Academy of Program and Project Leadership \(APPL\)](#)
- 3.1.5 [NASA Site for Online Learning and Resources \(SOLAR\)](#)
- 3.1.6 [JSC Training and Development](#)
- 3.1.7 [S&MA Training Resources \(Learner System\)](#)
- 3.1.8 [USA Flight-Ops Training Academy](#)
- 3.1.9 [NASA-TM-209370, NASA Software Training Course Listing](#)

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3.2 Available Software Training Classes

- 3.2.1 A list of typical software oriented training classes offered by NASA is located in Appendix B.

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APPENDIX A - MIN. TRAINING REQUIREMENTS FOR SOFTWARE PERSONNEL

| | Responsible Management | SW Lead | SW Engineer: Requirements, Design, Code & Test | SW Assurance | SW Configuration Management | SW Validation & Verification | JSC SEPG Member | Contract Monitoring or Program/Project Office | SW Supervisor | SW Safety Assurance |
|--|------------------------|---------|--|--------------|-----------------------------|------------------------------|-----------------|---|---------------|---------------------|
| SW Process Improvement Basics | R | R | | | | | R | H | | |
| SW Engineering Development Process Orientation | R | R | R | R | R | R | R | R | R | R |
| Project Management | H | H | | | | | | R | R | |
| Requirements Dev/Management | | R | H | R | | R | | R | | |
| SW Cost & Schedule Estimating | | R | | | | | | H | | |
| Inspection Process | | H | H | H | H | | | | | |
| SW Assurance | | R | | R | H | | | | | H |
| SW Configuration Management | | R | | H | R | | | | | H |
| Contracting Basics | H | H | | | | | H | R | | |
| Systems Eng. | | H | H | | | | | | | |
| Software Safety | | H | R | | | R | | | H | R |
| <i>R = Required H = Highly Encouraged</i> | | | | | | | | | | |

A list of courses adequate to meet the above criteria is maintained on the SEPG PAL.

Responsible Management – First-line management of organizations that perform designing, engineering, developing, maintaining, and assuring of software.

Software Lead - The first-line manager of a group of software developers. The software lead is an experienced software practitioner and is assigned responsibility to plan and direct the work of team members in all phases of a software project's life cycle, following standard processes developed for use on the project. The software lead takes direction from their Supervisor. For project purposes, the software lead typically reports to the project manager. Software Lead serves as a liaison between the employee and the Supervisor to assure software training opportunities are coordinated between parties.

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Software Engineer – The programmer, analyst, tester, or software engineer working as an individual contributor on any phase of a software project's life cycle. The software developer is primarily responsible for developing the work products associated with product engineering and takes direction from a software lead.

Software Assurance Specialist – A technical specialist whose assignment includes assuring that the requirements of NASA-STD-8739.8, *NASA Software Assurance Standard*, and Center and organizational software assurance requirements are properly implemented.

Software Verification and Validation – A technical specialist whose assignments include assuring the software meets the correct requirements have been specified for a particular intended use, or that the specified requirements have been met.

Software Configuration Management – A technical specialist whose duties include any of the following: Applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a configuration item, controlling changes to those characteristics, and recording and reporting change processing and implementation status.

JSC SEPG Member – An organizational representative to the JSC Software Engineering Process Group (SEPG). The SEPG functions to address Center-wide software issues, and to represent JSC's interests with respect to NASA-wide software issues. SEPG members represent their organization's interests in SEPG activities. SEPG members may be assigned activities by the SEPG.

Contract Monitoring or Program/Project Office – An employee whose duties include verifying that contract requirements are fulfilled. An employee who performs contract insight or oversight.

Software Supervisor - A manager at the organizational level, often a branch chief, who has overall accountability for software development and/or maintenance.

Software Safety Assurance – The Software Assurance specialist whose assignment includes assuring that the requirements of NASA-STD-8719.13B, *NASA Software Safety Standard*, and Center and organizational software safety requirements are properly implemented.

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APPENDIX B - TYPICAL SOFTWARE TRAINING CLASS AVAILABILITIES

Below is a selection of *typical* software courses offered by a variety of sources. Depending upon the offering, classes may be classroom based, computer based, or accessed by videoconference. Click on the associated source link to investigate current offerings and schedule:

[JSC Training and Development](#)

Courses from the *Training Course Catalogue* (follow link above for current list):

- Access 2000: Learning Access 2000 as a Front End Database
- C Programming - Introduction
- C++ Programming - Advanced
- C++ Programming - Introduction
- Cold Fusion - Advanced
- Cold Fusion - Introduction
- Dreamweaver MX
- Excel - Workshop
- Excel 2000 Bootcamp
- Flash MX
- FrontPage: Website Creation with Microsoft FrontPage
- Hypertext Markup Language (HTML) Scripting - Advanced
- Hypertext Markup Language (HTML) Scripting - Introduction
- JAVA - Advanced
- JAVA - Introduction
- JAVAScript
- Linux Administrators
- Linux Operation System - Introduction
- Programming for Beginners
- Spreadsheet Aided Engineering - Intermediate
- Spreadsheet Aided Engineering - Introduction
- SQL Programming - Introduction
- Web Graphics Construction - Introduction
- XML: Learning Extensible Markup Language (XML)

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[Government Online Learning Center](#)

Online training classes (follow link above for current list):

- C Programming
- C++ Programming
- Microsoft Visual C++
- Linux Administration
- Linux Technology Overview
- Object-Oriented Technology Analysis and Design
- UNIX Foundations
- UNIX HP-UX
- UNIX IBM AIX
- UNIX SCO / SVR 5
- UNIX Sun Solaris
- UNIX Shell Programming
- CORBA
- Database
- Dynamic HTML
- Enterprise JavaBeans
- HTML 4.0
- Java 2 Enterprise Connectivity
- Java 2 Programming
- Java Servlets
- Javascript
- JDBC
- UI Design
- XHTML
- XML
- C/C++ Programming
- Cobol
- Java 2
- Java 2 Programming
- Java Enterprise Connectivity
- Lotus Domino R6 Application Development
- Microsoft .NET Software Development Tools
- Microsoft Office 2000 Solution Development
- Microsoft Solution Architectures
- Microsoft Visual Basic 5.0
- Microsoft Visual Basic 6.0
- Microsoft Visual C++
- Rational Rose 2001
- Software Design Methodology
- Software Programming Fundamentals
- Scripting and Web Languages
- Web Site Design - Principles
- Web Site Design – Tools

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Site for Online Learning and Resources (SOLAR)

Online training courses (follow link above for current list):

- ColdFusion: Level 1
- Dreamweaver 4: Level 2
- Dreamweaver UltraDev 4: Level 1
- XML: An Introduction
- Flight Software
- Software Assurance
- Software System Safety

S&MA Training Resources (Learner System)

Classroom training (follow link above for current list):

- Advanced Risk Reduction Tool (ARRT)
- Applications Of Software Measurement
- CMM-Based Appraisal For Internal Process Improvement-SAIC
- CMMI, Introduction To
- CMM -Common Approach Orientation - SAIC
- CMMI-Integrated Measurements - SAIC
- CMMI-Integrated Peer Review Process-SAIC
- CMMI-Integrated QA Overview - SAIC
- CMMI-Intro To System & Software Estimation - SAIC
- CMMI-Software Engineering Principles-SAIC
- CMMI-Software Estimation Techniques & Tools-SAIC
- CMMI-Software Metrics For Tech Staff-SAIC
- CMMI-Software Test Process - SAIC
- CMMI-Team Building-SAIC
- Effective Methods Of Software Testing
- Effective Software Testing In Practice
- Introduction To Software Estimation - SAIC
- Managing Software Projects With Metrics
- Principles Of Software Program Testing
- Saphire Workshop--PRA Software Tool
- Shuttle Flight Software, Intro
- Software Acquisition CMM, Intro To The
- Software Acquisition Management
- Software Configuration Management
- Software Engineering - Building Software Quality Skills
- Software For ISS
- Software Milestone Review Safety Assessment
- Software Process Improvement
- Software Project Planning/Control (SSPC)
- Software Quality Assurance
- Software Reliability
- Software Requirements Engineering & Management
- Software System Safety
- Systems Engineering Intro
- Technical Reviews And Inspections
- Topics In Software Project Management

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NASA Training

Follow link above for current list. The classes normally will require travel to attend, or in some cases may be accessed by videoconference. Check the [Training Program Calendar](#) for specific course offerings and descriptions:

- CMM-based Software Process Improvement
- Software Capability Pre-Evaluation
- Software Capability Evaluation
- Overview of the CMM
- Overview of the CMMI
- Introduction to CMMI
- Standard CMMI Assessment Method for Pre-Evaluation of Process Improvement
- Standard CMMI Assessment Method for Evaluation of Process Improvement
- Intermediate Concepts of CMMI Models
- Intermediate Concepts of CMMI
- Software Process Engineering Group (SEPG) Workshop
- Mastering Process Improvement (MPI)
- Software Acquisition (SA-CMM) Overview
- Management Steering Group (MSG) Workshop
- Software Requirements Management
- Software Configuration Management (CM)
- Software Quality Assurance (SQA)
- Software Estimating and Costing